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RECENT ADVANCES IN OUR KNOWLEDGE OF THE LAGERSTATTEN THAT OCCURS IN THE TLAYUA QUARRIES NEAR TEPEXI DE RODRIGUEZ, PUEBLA, MEXICO

Since the last meeting in 1995 the opening of new quarries, investigations and scientific works have greatly increased our knowledge of the biodiversity and paleoenvironment of the middle member of the Tlayua Formation. Field work in the surrounding strata of a similar or older age has also added to our understanding of the fossiliferous beds. This new information has confirmed the original ideas expressed in the previous model. Today we have ten described species 1. *Atocatle ranulfoi* Fieldman et al.,1998, a spider; 2. *Ixtahua benjamini* Fieldmann et al.1998, a dragon fly nymph; 3. *Archaeoniscus aranguhtyorum* Fieldman et al, 1998, an isopod; 4. *Protaegla miniscula* Fieldman et al, 1998, a decapod; 5.*Tepexicarcinus tlayuaensis* Fieldman, et al, 1998, a crab; 6.*Teoichthys kallistos* Applegate, 1988, a halecomorph; 7.*Tepexichthys arangutyorum* Applegate, 1993, a pycnodont; 8. *Pachyamia mexicana* Grande and Bremis, 1998. an amiid; 9. *Pamizinsaurus tlayuaensis* Reynoso, 1997 a terrestrial rhynchocephalian; 10.*Huehuecuetzpalli mixtecus* Reynoso, 1998 a lizard. Species that have been described from other localities are: 11. *Axelrodichthys aranpensis* Maisey,1986 a coelacanth; 12.*Neohibolites praeultimus* Spaeth, 1965;13.*Neohibolites* aff. *minimus pinguis* Stolley, 1911; 14.*Neohibolites minimus obtusus* Stolley, 1911; 15. *Neohibolites minimus clavaformis* Stolley, 1911, all beleminites; and16. *Anhanguera* cf. *santanae* Campos and Kellner, 1985, a pterosaur. To this we might add seven sea cucumbers, which are being described and at least 8 new taxa of fishes including a berycoid and a Stratodus-like genus and a new lizard. For us the idea that we had monsoonal storm systems in affect in tlayuanian (Albian) times has become even more tenable. It is striking how much of the Tlayua paleoenvironment parallels that of its older sister lagoon, Solnhofen in Germany. In our case. however: 1. the Tethys Ocean was to the extreme east; 2. followed by an extensive coral reef barrier running parallel to the coast of Acatlandia containing rudisted zones and associated patch reefs; 3. a biorich lagoon with intensively bioturbinated sediments occurs in the lower member of the Tlayua Formation but as yet we have not done the field work necessary to discover this lagoon in relationship with the middle member that is, if exposures do indeed exist; 4. a barrier perhaps formed by the emergence of an older dead reef Is still of a theoretical nature though the model calls for both structures; 5. the shallow Tlayua lagoon with an oxygen starved or hypersaline bottom is however well established. The fact that a live fish fauna lived above the hypersaline waters can also be proven; 6. the land to the west, Acatlandia consisting during Albian times of the deeply eroded and peneplained metamorphic Acatlan complex. The presence of intermittent streams or rivers is on a much firmer foundation particularly with the fresh

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water elements of our fauna; 7.The plant remains so far discovered in the Tlayua beds suggest a tropical but arid land area. We now know what was suspected with the discovery of dragonfly nymph that fresh water must have existed at times either in the Tlayua lagoon or in the nearby streams or rivers. One seems to be still faced with three possibilities of the land connections: I. that Acatlandia is a very large island. The seemingly archaic nature of the reptilian part of the Tlayua fauna could support this idea; 2. the presence of a North American connection not a highly favored idea for many Mexican geologists but one that may be supported in part by dinosaur track ways in Oaxaca and Michoacan of supposed Albian age along with the recently found fragments of a large lower Cretaceous dinosaur in beds about 20 miles south of Tepexi de Rodriguez in slightly older beds; 3. a South American connection which finds its support in a newly discovered pterosaur that is identical or nearly so to one of the Santana species *Anhanguera santanae* Campos and Kellner, 1985 and the coelacanth *Axelrodichthys aranpensis* Maisey, 1986, another Brazilian Santana form. Also there is the presents of five fish genera that might be specifically identical to Santana species. These are *Vinctifer, Belonostomus, Cladocyclus, Brannerion and Notelops*. The mechanism for deposition has become clearer. The best available evidence, chemical analysis, suggests that the red layers of hematite were deposited from the eroded Acatlandia clays during the times of the proposed monsoonal storms. High tides and winds drove the waters of the Tethys Ocean and the biorich lagoon over or breaching the barrier. ripping up soft-bodied corals, crinoids and attached algae from the reef and bay bottom killing fishes and invertebrates. At the same time from the normally arid and peneplained Acatlandia, flooded rivers and streams loaded with the red hematitic clays poured into the Tlayua lagoon creating a soup of the transported suspended hematite, and calcium carbonate from the bottom. Mixed in this were the dead and dying remains of numerous organisms, from the coral reefs, the biorich lagoon, the air, and the rivers. We now feel at times the Tlayua lagoon may have even have been flooded with freshwater which could persisted at the surface and near the shore. Wave motion played only a small part in disturbing the final deposition as most of its force had been spent in crossing the barrier. So disturbed layers though they do occur are rare. Each storm sequence formed a red layer. As the red soup settled the hypersalinity increased, that and the lack of oxygen created a lethal zone so that scavenging the remains became more and more difficult. The toxic nature of the bottom is proven by a number of things. There is no infauna except for the presence of miliolid foraminifera that accumulate on the fish remains as if they are living on the decay products of the tissues. A hypersalinal or oxygen deficient environment is shown by the shortness of invertebrate trails. A school (all are 24 cm in total length) of fishes twenty five clupieds entered the toxic waters and were instantly killed the heads being thrown back in a contorted stance and then afterward through a gentle current being aligned. An elopomorph struggling with a half swallowed fish sank into the lethal waters with its unfinished meal. The serpent stars with their arms withered in knot-like convolutions are a known indication of hypersalinity. No pseudomorphs of salt crystals have been discovered but finely disseminated gypsum crystals have been recovered in the quarry in keeping with the ideas of a hypersaline bottom. This is the faule, a Solnhofen term that is applicable in The Tlayua quarries the faule is the red or hematitic layer this like Solnhofen is the layer that represents a short time span and represents the beds that the fossils occur in. The flinz consists of lithographic limestones. Several factors could be involved in the formation of the lithographic limestone: 1. chemical precipitation; 2. a presence of planktonic organisms in the lagoonal waters. This possibility is strengthened by the presence of layers of foraminifera recently discovered in the Tlayua quarries which favor this possibility; 3. The third possibility is the presence of extensive cyanobacterial mats which seem to occur in the flinz as well as the faule. They are more abundant in the upper layers in our quarries. For Solnhofen a faunal diversity of 600 species has been given. The diversity of the Tlayua fauna is unknown at this time. We estimate 100 species but the Solnhofen number is well with the realm of possibility.

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